



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 33

[Docket No. FAA-2014-0376; Notice No. 33-014-SC]

Special Conditions: SNECMA, Silvercrest-2 SC-2D; Rated 10-Minute One Engine

Inoperative Takeoff Thrust at High Ambient Temperature

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These final special conditions are issued for the SNECMA, Silvercrest-2 SC-2D engine model. This engine will have a novel or unusual design feature – an additional takeoff rating that increases the exhaust gas temperature (EGT) limit to maintain takeoff thrust in certain high ambient temperature conditions with one engine inoperative (OEI) for a maximum of 10 minutes. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These final special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: The effective date of these special conditions is **[insert date 30 days after date of publication in the Federal Register]**.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning this rule, contact Tara Fitzgerald, ANE-111, Engine and Propeller Directorate, Aircraft Certification Service, 12 New England Executive Park, Burlington, Massachusetts, 01803-5213; telephone (781) 238-7130; facsimile (781) 238-7199; e-mail tara.fitzgerald@faa.gov. For legal questions

concerning this rule, contact Vincent Bennett, ANE-7, Engine and Propeller Directorate, Aircraft Certification Service, 12 New England Executive Park, Burlington, Massachusetts, 01803-5299; telephone (781) 238-7044; facsimile (781) 238-7055; email vincent.bennett@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

On April 19, 2011, SNECMA applied for a new type certificate (TC) for the Silvercrest-2 SC-2D engine model. For their Silvercrest-2 SC-2D engine model, SNECMA requested an additional takeoff rating to maintain takeoff thrust in certain high ambient temperature conditions with OEI. Therefore, the Silvercrest-2 SC-2D engine model will have two different takeoff ratings. The first rating corresponds with the rated takeoff thrust of the engine. The second takeoff rating maintains the takeoff thrust in certain high ambient temperature conditions for a maximum of 10 minutes when one engine is inoperative. This additional takeoff rating is named, “Rated 10-Minute OEI Takeoff Thrust at High Ambient Temperature” (Rated 10-minute OEI TOTTHAT).

These final special conditions are necessary because current part 33 regulations do not contain airworthiness standards for airplane applications of OEI ratings. For an airplane application, the OEI rating is the same as the rated thrust of the engine. All OEI ratings in current part 33 regulations are only applicable to rotorcraft applications. These final special conditions were modeled based on the rotorcraft requirements for the 30-second and 2-minute OEI ratings, and modified to represent the airplane application. The Rated 10-minute OEI TOTTHAT shares common features, such as the need to notify the pilot and maintenance personnel about the rating's use, provides data needed for power assurance check, and continued validation of the related maintenance procedures.

The Rated 10-minute OEI TOTHAT is for use during OEI events that occur during takeoff in high ambient temperature conditions, up to 5 degrees Celsius hotter than the rated takeoff thrust corner point. Under these unique conditions (extreme hot day and OEI), the Rated 10-minute OEI TOTHAT leads to an increase in EGT to maintain the takeoff thrust of the engine. These final special conditions contain additional mandatory post-flight inspection and maintenance action requirements associated with any use of the Rated 10-minute OEI TOTHAT. These requirements add a rating definition in part 1.1; mandatory inspections in the ICA; instructions for installing and operating the engine; engine rating and operating limitations; instrument connection; and endurance testing.

The current requirements of the endurance test under § 33.87 represent a typical airplane flight profile and the severity of the takeoff rating. Therefore, the endurance test under § 33.87 covers normal, all-engines-operating takeoff conditions for which the engine control system limits the engine to the takeoff thrust rating. These final special conditions for the endurance testing requirements are intended to represent the airplane flight profile when an OEI event occurs during takeoff under specified ambient temperatures, and until the mandatory inspection and maintenance actions can be performed. These final special conditions require endurance testing that is not less than 135 minutes in duration and demonstrates the engine is capable of the additional Rated 10-minute OEI TOTHAT rating at the higher EGT limit following completion of the tests required by § 33.87(b), without disassembly or modification.

The associated engine deterioration after use of the Rated 10-minute OEI TOTHAT is not known without the intervening mandatory inspections in these special conditions. The mandatory inspections ensure the engine will continue to comply with its certification basis after any use of the Rated 10-minute OEI TOTHAT. The applicant is expected to assess the

deterioration from use of the Rated 10-minute OEI TOTHAT. The Airworthiness Limitations section must prescribe the mandatory post-flight inspections and maintenance actions associated with any use of the Rated 10-minute OEI TOTHAT.

These special conditions are necessary because the applicable airworthiness regulations do not contain adequate or appropriate safety standards for the additional takeoff rating, and their requirements maintain a level of safety equivalent to the level intended by the applicable airworthiness standards in effect on the date of application.

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17, SNECMA must show that the Silvercrest-2 SC-2D meets the applicable provisions of the applicable regulations in effect on the date of application, except as detailed in paragraphs 21.101(b) and (c). The FAA has determined the following certification basis for the Silvercrest-2 SC-2D engine model:

1. 14 CFR part 33, “Airworthiness Standards Aircraft Engines,” dated February 1, 1965, with Amendments 33-1 through 33-31, dated July 18, 2011.

If the FAA finds that the regulations in effect on the date of the application for the change do not provide adequate or appropriate safety standards for the Silvercrest-2 SC-2D because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to complying with the applicable product airworthiness regulations and the requirements of these special conditions, the Silvercrest-2 SC-2D engine model must also comply with the fuel venting and exhaust emission requirements of 14 CFR part 34.

The FAA issues special conditions, as defined in 14 CFR 11.19, per § 11.38, and they become part of the type certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The SNECMA Silvercrest-2 SC-2D engine model will incorporate an additional takeoff rating to maintain takeoff thrust in certain high ambient temperature OEI takeoff conditions for a maximum of 10 minutes. The result will be two different takeoff ratings, one for the rated takeoff thrust of the engine and the other to maintain the takeoff thrust in certain high ambient temperature OEI takeoff conditions for a maximum of 10 minutes. The additional takeoff rating is referred to as “Rated 10-Minute OEI Takeoff Thrust at High Ambient Temperature” (Rated 10-minute OEI TOTHTAT).

The Rated 10-minute OEI TOTHTAT is a novel and unusual design feature that requires additional airworthiness standards for type certification of the SNECMA Silvercrest-2 SC-2D engine model.

Discussion of Comments

A notice of proposed special conditions, No. 33-14-01-SC, for the Silvercrest-2 SC-2D engine model was published in the Federal Register on July 31, 2014 ([79 FR 44321](#)). We did not receive any public comments. We did, however, modify the proposed special conditions by removing requirement (b) under “§ 33.28, Engine control systems.” These requirements are addressed at the aircraft level.

Applicability

As discussed above, these special conditions are applicable to the Silvercrest-2 SC-2D engine model. Should SNECMA apply at a later date for a change to the type certificate to include another engine model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

We reviewed the available data and determined that air safety and the public interest require adopting these special conditions. This action affects only the Rated 10-minute OEI TOTTHAT features on the Silvercrest-2 SC-2D engine model. It is not a rule of general applicability and applies only to SNECMA, who requested FAA approval of this engine feature.

List of Subjects in 14 CFR Part 33

Air Transportation, Aircraft, Aviation, Aviation safety, Safety.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the SNECMA Silvercrest-2 SC-2D engine model.

1. Part 1.1, Definitions.

“Rated 10-Minute One Engine Inoperative Takeoff Thrust at High Ambient Temperature” (Rated 10-minute OEI TOTTHAT) means the approved engine thrust developed under specified altitudes and temperatures within the operating limitations established for the engine, and for continuation of flight operation after failure or shutdown of one engine in a multi-engine airplane

during takeoff operation. Use is limited to two periods, no longer than 10 minutes each in any one flight, and followed by mandatory inspection and maintenance actions.

2. Part 33 Requirements.

In addition to the airworthiness standards in 14 CFR part 33, effective February 1, 1965, Amendments 33-1 through 33-31 applicable to the engine and the Rated 10-minute OEI TOTHAT, the following special conditions apply:

§ 33.4 Instructions for Continued Airworthiness.

- (a) The Airworthiness Limitations section must prescribe the mandatory post-flight inspections and maintenance actions associated with any use of the Rated 10-minute OEI TOTHAT.
- (b) The applicant must validate the adequacy of the inspections and maintenance actions required under paragraph § 33.4(a) of these special conditions.
- (c) The applicant must establish an in-service engine evaluation program to ensure the continued adequacy of the instructions for mandatory post-flight inspections and maintenance actions prescribed under paragraph § 33.4(a) of these special conditions, and of the data for thrust assurance procedures required by § 33.5(b)(1) of these special conditions. The program must include service engine tests or equivalent service engine test experience on engines of similar design and evaluations of service use of the Rated 10-minute OEI TOTHAT.

§ 33.5 Instruction manual for installing and operating the engine.

- (a) Installation instructions:
 - (1) The applicant must identify the means, or provisions for means, provided in compliance with the requirements of § 33.29 of these special conditions.
 - (2) The applicant must specify that the engine thrust control system automatically resets the thrust on the operating engine to the Rated 10-minute OEI TOTHAT level when one engine fails

during takeoff at specified altitudes and temperatures, and that the Rated 10-minute OEI TOTHAT is not available when all engines are operational.

(b) Operating instructions:

(1) The applicant must provide data on engine performance characteristics and variability to enable the airplane manufacturer to establish airplane thrust assurance procedures.

§ 33.7 Engine ratings and operating limitations.

(a) The Rated 10-minute OEI TOTHAT and the associated operating limitations are established as follows:

(1) The thrust is the same as the engine takeoff rated thrust with extended flat rating corner point,

(2) The rotational speed limits are the same as those associated with the engine takeoff rated thrust,

(3) The applicant must establish a gas temperature steady-state limit and, if necessary, a transient gas overtemperature limit for which the time duration is no longer than 30 seconds, and

(4) The use is limited to two periods of no longer than 10 minutes each in any one flight, and followed by mandatory inspection and maintenance actions prescribed by § 33.4(a) of these special conditions.

(b) The applicant must propose language to include in the type certificate data sheet specified in § 21.41 for the following:

(1) The Rated 10-minute OEI TOTHAT and associated limitations.

(2) As required by § 33.5(b), Operating instructions, include a note stating that “Rated 10-Minute One Engine Inoperative Takeoff Thrust at High Ambient Temperature” (Rated 10-minute OEI TOTHAT) means the approved engine thrust developed under specified altitudes and temperatures within the operating limitations established for the engine, and for continuation

of flight operation after failure or shutdown of one engine in a multi-engine airplane during takeoff operation. Use is limited to two periods, no longer than 10 minutes each in any one flight, and followed by mandatory inspection and maintenance actions.

(3) As required by § 33.5(b), Operating instructions, include a note stating that the engine thrust control system automatically resets the thrust on the operating engine to the Rated 10-minute OEI TOTHAT level when one engine fails during takeoff at specified altitudes and temperatures, and that the Rated 10-minute OEI TOTHAT is not available when all engines are operational.

§ 33.28 Engine control systems.

The engine must incorporate a means, or a provision for a means, for automatic availability and automatic control of the Rated 10-minute OEI TOTHAT.

§ 33.29 Instrument connection.

(a) The engine must:

(1) Have means, or provisions for means, to alert the pilot when the Rated 10-minute OEI TOTHAT is in use, when the event begins, and when the time interval expires.

(2) Have means, or provision for means, which cannot be reset in flight, to:

(i) Automatically record each use and duration of the Rated 10-minute OEI TOTHAT, and

(ii) Alert maintenance personnel that the engine has been operated at the Rated 10-minute OEI TOTHAT, and permit retrieval of recorded data.

(iii) Have means, or provision for means, to enable routine verification of the proper operation of the means in § 33.29(a)(1) and (a)(2) of these special conditions.

§ 33.85(b) Calibration tests.

The applicant must base the calibration test on the thrust check at the end of the endurance test required by § 33.87 of these special conditions.

§ 33.87 Endurance test.

(a) Following completion of the tests required by § 33.87(b), and without intervening disassembly, except as needed to replace those parts described as consumables in the ICA, the applicant must conduct the following test sequence for a total time of not less than 135 minutes:

- (1) Ten minutes at Rated 10-minute OEI TOTHAT,
- (2) Sixty-five minutes at rated maximum continuous thrust,
- (3) One minute at 50 percent of rated takeoff thrust,
- (4) Ten minutes at Rated 10-minute OEI TOTHAT,
- (5) One minute at flight idle,
- (6) Ten minutes at Rated 10-minute OEI TOTHAT,
- (7) Five minutes at rated maximum continuous thrust,
- (8) One minute at 50 percent of rated takeoff thrust,
- (9) Five minutes at Rated 10-minute OEI TOTHAT,
- (10) One minute at flight idle,
- (11) Ten minutes at Rated 10-minute OEI TOTHAT,
- (12) Five minutes at rated maximum continuous thrust,
- (13) One minute at 50 percent of rated takeoff thrust,
- (14) Nine minutes at Rated 10-minute OEI TOTHAT, and
- (15) One minute at flight idle

(b) The test sequence of § 33.87(a)(1) through (a)(15) of these special conditions must be run continuously. If a stop occurs during these tests, the interrupted sequence must be repeated unless the applicant shows that the severity of the test would not be reduced if the current tests were continued.

(c) Where the engine characteristics are such that acceleration to the Rated 10-minute OEI TOTHAT results in a transient overtemperature in excess of the steady-state temperature limit identified in § 33.7(a)(3) of these special conditions, the transient gas overtemperature must be applied to each acceleration to the Rated 10-minute OEI TOTHAT of the test sequence in § 33.87(a) of these special conditions.

§ 33.93 Teardown inspection.

The applicant must perform the teardown inspection required by § 33.93(a) after completing the endurance test prescribed by § 33.87 of these special conditions.

§ 33.201 Design and test requirements for Early ETOPS eligibility.

In addition to the requirements of § 33.201(c)(1), the simulated ETOPS mission cyclic endurance test must include two cycles of 10 minute duration, each at the Rated 10-minute OEI TOTHAT; one before the last diversion cycle and one at the end of the ETOPS test.

Issued in Burlington, Massachusetts, on October 23, 2014.

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